COMPUTING SPECTRAL GAPS IN QUASIPERIODIC HAMILTONIANS

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Quasicrystals are arrangements of atoms which are not translation invariant, but resemble ordinary crystals in many ways, such as in their diffraction spectrum. Another mathematically interesting feature of periodic physical systems is that the spectrum of Hamiltonians such as the magnetic Laplace operator consists of bands and gaps. Numerical experiments have suggested that quasiperiodic systems have spectral gaps as well, but the usual mathematical explanation for the periodic case (Bloch-Floquet transform) does not work for them. In this talk, I will present a different way to conclude that an infinite system has gaps, on the basis of certain properties that must hold for all finite parts of the system. In the case of a magnetic Laplace operator on a quasicrystal, these properties can be verified numerically, allowing us to give a mathematical proof (with computer support) that its spectrum has gaps at certain energies.